

Affects of Paclobutrazol, Biological Control Agents, and Other Seed Enhancements on Processing Tomato Growth, Disease Control and Yield

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Introduction:

Stretching and legginess in processing tomato transplants becomes a problem when field planting in the spring is delayed due to weather conditions. Increased internode length and thin, weak stems can also be caused by cloudy or warm weather during transplant production. Difficulties in mechanical transplanting and field survival are challenges that processing tomato growers face with increased transplant heights. Preliminary work at OSU on processing tomatoes suggests a stockier, shorter transplant can be produced with the use of the growth regulator paclobutrazol (Bonzi™) as a seed soak prior to sowing. Biological control agents (BCA's) are another transplant technology worthy of more research. BCA's are beneficial bacteria or fungi that colonize on the roots and can be effective against *pythium*, *phytophthora*, *rhizoctonia*, *fusarium*, *alternaria*, and *botrytis*. The objective of this research was to test the use of paclobutrazol for height control and applications of BCA's for disease suppression on processing tomatoes. This research involved a greenhouse study to compare plants with and without Bonzi™ application to pelleted seed and biological agents to determine its affect on processing tomato transplant height and (2) a field study to determine any subsequent effects in the field on flowering and or/time to harvest, yield, and disease pressure with and without Bonzi™ and biological controls.

Materials and Methods:

Greenhouse Study: On April 22, 2002, 4 replications of 4 processing tomato seed lots (raw and pelleted) were sown into 288 plug trays. Treatments consisted of the following:

variety	seed trt	Bonzi (Y/N)	Biological application (Y/N)
611	Seed Systems PPI maxi coat	Y	N
611	Seed Systems PPI maxi coat	Y	Y
611	Seed Systems PPI maxi coat	N	Y
611	Seed Systems PPI maxi coat	N	N
611	Incotec 136 Mini	Y	N
611	Incotec 136 Mini	Y	Y
611	Incotec 136 Mini	N	Y
611	Incotec 136 Mini	N	N
9704	Seed Systems PPL mini coat	Y	N
9704	Seed Systems PPL mini coat	Y	Y
9704	Seed Systems PPL mini coat	N	Y
9704	Seed Systems PPL mini coat	N	N
RG611	Raw - trted by Pro Seed Technology	Y	N
RG611	Raw - trted by Pro Seed Technology	Y	Y
RG611	Raw - trted by Pro Seed Technology	N	Y
RG611	Raw - trted by Pro Seed Technology	N	N

Prior to covering the seed with soil-less mix, trays receiving paclobutrazol were misted with 20 mls of solution at 500 ppm. Trays were placed in the greenhouse and germination rates were recorded weekly for 3 weeks. Plant height was recorded at 2, 3, 4 and 5 weeks. Prior to field transplant, plant height and stem diameter was recorded.

Field Study: All bonzi/biological combinations of two pelleted seed lots ('611' Incotec 136 Mini and '9704' Seed Systems PPL mini coat) were planted in 4 replications for this field study along with 2 reps of the raw seedlot ('RG611'). Companion™, a liquid biological control agent, was mixed at the rate of 0.16 fl. oz/ gallon H₂O. Each tray receiving BCA treatment received 650 mls (1.36 pts) of solution. Plants were transplanted to the field at the Veg Crops Branch in Fremont, Ohio into raised beds on June 7, 2002. One month after field transplant, plant height and stem diameter were recorded and a second application of Companion™ was applied at the rate of 0.16 fl./oz gallon H₂O. All other cultural practices used followed standard practices for the Midwest U.S. Plots were mechanically harvested on October 2, 2002. Red, green and cull weights were recorded. Average marketable fruit size was recorded from 50 random fruit/plot. All cull fruit were further graded into disease and physiological disorders to determine if Companion™ had any effect on disease development.

Results and Discussion:

Germination 3 weeks after seeding was not significantly different for the Bonzi treatments in the three pelleted seed lots. Germination was slightly reduced in the raw seedlot. At four weeks after seeding, plant height was significantly reduced with the use of paclobutrazol at 500 ppm prior to sowing. Similar results were recorded at transplant when paclobutrazol treated seedlings remained shorter and had thicker stems.

One month after transplant, there were no significant differences in plant height or stem diameter between plants treated with paclobutrazol and untreated plants. Cultivar '611' had no difference in marketable red fruit regardless of +/- paclobutrazol and biological control. Control for '9704' receiving no paclobutrazol or biological control, showed a reduction in marketable red T/A, and showed the significantly higher percentage of green fruit. There were no significant differences in average fruit weight for any of the treatments in either cultivar. There were no differences in the incidence of blossom end rot, anthracnose, ground rot, buckeye rot or other cull categories except early blight. There was a difference in early blight when comparing the two cultivars '611' and '9704', but differences were not significant among treatments within each cultivar.

Table 1. Affects of Paclobutrazol, Biological Control Agents and Other Seed Enhancements on Processing Tomato Growth, Disease Control and Yield - 2002

OSU Hort & Crop Science Greenhouse

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Cultivar	Seed Treatment	Bonzi (Y/N) / Biologicals (Y/N)		--1 WAS*--	-- 2 WAS --	-- 3 WAS --	-- 4 WAS--	--5 WAS--	-- At Transplant ---			
		% Germ	% Germ	Plant ht (cm)	% Germ	Plant ht (cm)	Plant ht (cm)	Plant ht (cm)	Plant ht (cm)	Plant ht (cm)	Stem diam. (mm)	
611	Seed Systems PPI maxi coat	Y	N	67	85	3.3	85	5.0	5.3	6.5	9.8	3.3
611	Seed Systems PPI maxi coat	Y	Y	76	90	3.5	91	5.7	6.2	6.8	9.0	3.3
611	Seed Systems PPI maxi coat	N	Y	81	90	6.0	91	8.4	9.4	10.6	13.9	3.1
611	Seed Systems PPI maxi coat	N	N	82	88	5.3	88	8.0	11.1	13.1	15.6	2.9
611	Incotec 136 Mini	Y	N	61	75	3.1	78	4.8	5.6	6.0	8.3	3.2
611	Incotec 136 Mini	Y	Y	68	78	3.2	81	4.9	5.9	6.6	9.6	3.5
611	Incotec 136 Mini	N	Y	59	73	5.9	74	8.6	10.3	12.1	17.6	3.0
611	Incotec 136 Mini	N	N	68	77	5.8	78	9.1	9.7	12.8	16.3	2.8
9704	Seed Systems PPL mini coat	Y	N	57	74	1.8	77	3.1	3.9	5.2	8.9	3.2
9704	Seed Systems PPL mini coat	Y	Y	48	72	2.3	74	3.4	4.7	5.9	9.8	3.5
9704	Seed Systems PPL mini coat	N	Y	64	81	4.4	86	6.2	9.0	11.7	19.0	2.7
9704	Seed Systems PPL mini coat	N	N	79	88	3.8	89	6.0	8.4	12.0	18.4	2.7
RG611	Raw - trted by Pro Seed Technology	Y	N	63	63	3.6	65	5.3	6.5	7.2	10.7	3.5
RG611	Raw - trted by Pro Seed Technology	Y	Y	51	56	3.5	58	5.4	6.5	7.6	11.1	3.6
RG611	Raw - trted by Pro Seed Technology	N	Y	54	59	4.7	60	7.6	9.3	10.5	14.9	3.1
RG611	Raw - trted by Pro Seed Technology	N	N	60	64	5.9	67	9.1	10.7	11.0	15.4	3.1
LSD (0.05)				13.7	10.0	0.54	9.6	0.74	0.79	1.24	1.58	0.25
CV				20.4	16.3	32.8	15.5	31.2	30.2	31.6	29.1	10.2

* WAS = weeks after seeding

Table 2. Affects of Pacllobutrazol, Biological Control Agents and Other Seed Enhancements on Processing Tomato Growth, Disease Control and Yield - 2002.
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		- 1 mth after transplant -										YIELD				
Cultivar	Seed Treatment	Bonzi (Y/N)	Biologicals (Y/N)	Plant ht (cm)	Stem diam. (mm)	Red T/A	Green T/A	Culls T/A	% red	Avg. fruit wt (lbs)	BER (lbs/plot)	Anthracnose (lbs/plot)	Culls		Buckeye rot (lbs/plot)	others
													Early blight (lbs/plot)	Ground rot (lbs/plot)		
611	Incotec 136 Mini	Y	N	30.7	9.6	27.4	5.2	1.8	80	0.15	0.1	8.3	1.0	1.5	0.0	1.3
611	Incotec 136 Mini	Y	Y	30.9	9.6	24.2	3.5	3.3	78	0.15	0.1	14.6	1.7	2.1	0.2	4.4
611	Incotec 136 Mini	N	Y	29.6	9.1	25.0	5.2	2.7	76	0.15	0.2	12.2	1.8	1.7	0.0	3.1
611	Incotec 136 Mini	N	N	31.4	10.0	24.5	4.0	2.5	79	0.15	0.0	11.2	1.8	1.4	0.0	2.9
9704	Seed Systems PPL mini coat	Y	N	32.8	9.4	30.0	9.3	1.2	74	0.14	0.0	5.5	0.3	1.4	0.0	0.8
9704	Seed Systems PPL mini coat	Y	Y	32.2	9.3	28.6	8.4	1.6	74	0.15	0.0	7.6	0.4	1.2	0.0	2.0
9704	Seed Systems PPL mini coat	N	Y	28.9	8.4	23.9	10.9	1.6	67	0.14	0.1	8.1	0.1	0.9	0.0	2.0
9704	Seed Systems PPL mini coat	N	N	23.8	7.6	21.3	14.2	2.0	58	0.15	0.0	10.1	0.5	1.5	0.0	1.9
LSD (0.05)				NS	NS	4.5	5.19	NS	9.75	NS	NS	NS	0.9	NS	NS	NS
p value				0.06	0.06			0.166		0.844	0.65	0.385		0.666	0.218	0.27
CV				14.2	12.7	14.9	62.6	56.5	12.5	6.5	22.8	57.9	92.2	53.3	50.0	30.8
2 Rep Observations:																
RG611	Raw-treated by Pro Seed Technology	Y	N	24.5	7.2	24.0	7.0	1.3	74	0.14	0	6.1	0.6	1.1	0	1
RG611	Raw-treated by Pro Seed Technology	Y	Y	31.8	9.8	26.6	7.6	1.5	74	0.14	0	6.4	0.5	2.2	0	1.3
RG611	Raw-treated by Pro Seed Technology	N	Y	30.2	9.7	27.1	4.0	1.6	83	0.14	0	7.1	0.9	0.9	0	1.9
RG611	Raw-treated by Pro Seed Technology	N	N	29.6	9.4	28.3	3.5	1.5	85	0.14	0	6.5	1.4	1.4	0	1.3